Research Impact Evaluation

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What are we talking about when we talk about Impact?

Extent to which publications are:

- Read
- Discussed/Reviewed
- Utilized

….And

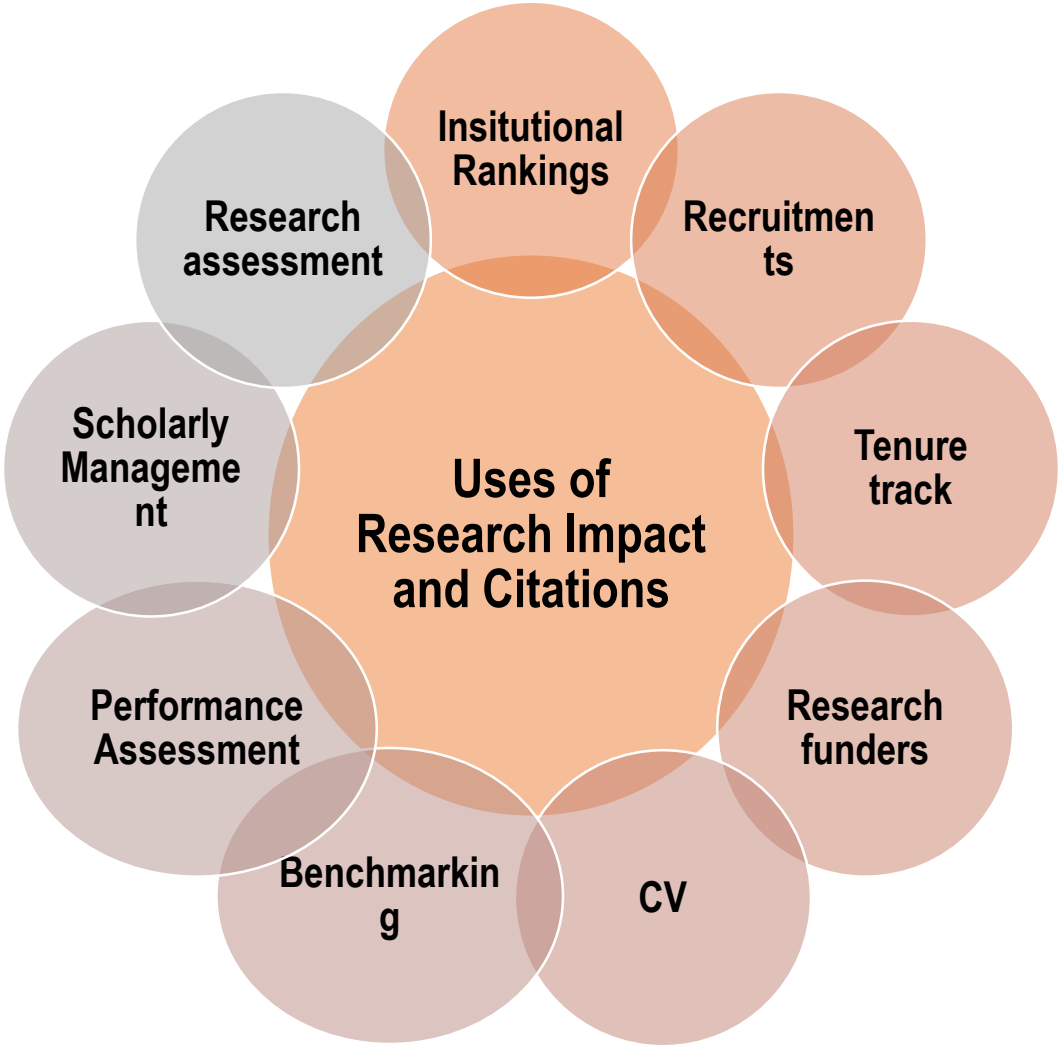
- Disseminated

Inside and outside academia

Bibliometrics

- Bibliometrics are quantitative methods of studying scientific research using publications as a proxy for research
- It can be used to study the impact of a publication, an author or an institution based on the number of times scholarship and/or authors have been cited by others
- Bibliometric indicators, like *Journal Impact Factor, h-index*, are used to measure research impact and publication activity
- Three known citation analysis databases are Web of Science, Scopus and Google Scholar

What is research impact used for?



Impact of scientific publications

What are we evaluating?

- **Journal Quality** – Journal Rank in a particular field
- **Article impact/Influence** – Publications and citation trends over time
- **Article reach** – Number of downloads, reads
- **Dissemination/Funding**- Which agencies/foundations have funded my research topic?
- **Researcher Impact** – What is my altmetric score? H-index?

Metrics

- Article-Level Metrics
  - **Citation counts**
- Journal-Level Metrics
  - Measure quality of Journal using **Journal Impact Factors**
- Author-Level Metrics
  - Measure bibliographic impact of individual authors (**h-index**)
- Other advanced indicators: RCR, Normalized metric scores, Percentiles

Citation Counts

Useful for	Measuring a component of impact of an individual's work or a set of publications
Not useful for	Understanding context of the impact
Possible Examples of use	Individual Institution Promotion and Tenure, Research Funding Applications

Author Level Metrics

H- Index: A scholar with an index of n has published n papers each of which has been cited in other papers at least n times.

So if you have a h index of 10 you have 10 papers each with 10 or more citations.

Created by Hirsch in 2005

Prof. Jorge E Hirsch, Dept of Physics, University of California, San Diego

H-Index Advantages

- It is simple to compute and does not require data processing
- It produces a single number that combines both the quality and quantity of the scholar’s publications
- It can be easily obtained from any publication indexing databases such Web of Science, Google Scholar

H-Index Limitations

- Affected by discipline, stage of career, etc. - It favors senior researchers and older publications
- Sensitive to authors with a small number of highly cited papers; it does not give extra credit to highly cited papers
- It provides little or no context for comparison, as h-index will only increase
- Includes self-citations

Alonso et al., Journal of Informetrics Vol3; Issue 4, 2009

Journal Impact Factor

$$\text{JIF}\ (2015) = \frac{\text{Total citations received in all items}(2015)}{\text{Citable items (2013 and 2014)}}$$

Where "Total citations received in all items (2015)" is the number of times that all items published in 2013 and 2014 were cited in 2015

Citable:

Research article, proceeding paper, reviews

Not citable:

Editorial materials (commentary, perspective, letter, etc.)

Journal Impact Factor Manipulation

Lu et al., Bibliometric Research Symposium NIH 2018

Journal Impact Factor

Useful For

Good predictor of journal quality

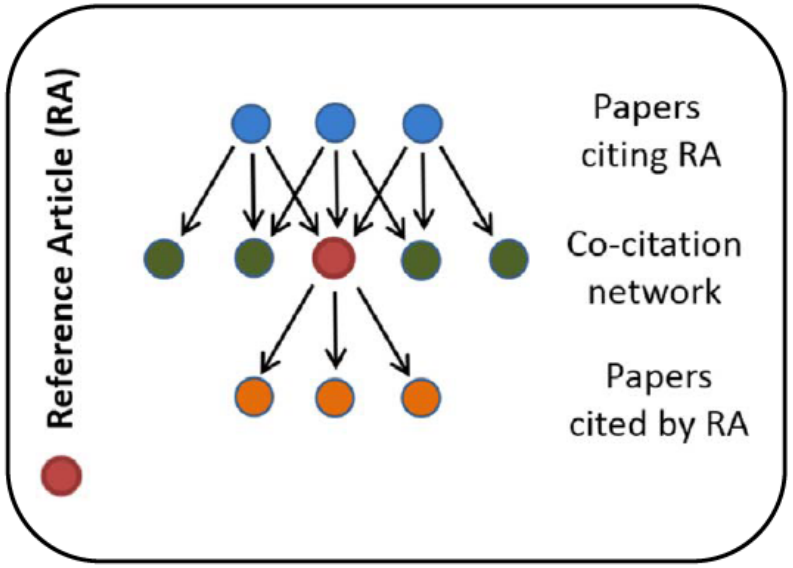
Not Useful For

Comparing journals across different subject categories

JIF Ranking

- JIF can be better understood in the context of Journal Ranking in a field
- Example: All my papers are published in the Top 10% Ranked journals in Neuroscience

Other Advanced Indicators: RCR



- **article citation rate (ACR):** average number of citations that a reference article obtains per year
- **field citation rate (FCR):** is derived from the ACRs of the co-citation network
- **expected citation rate (ECR):** is the field-normalized FCR.

$$RCR = \frac{Article\ Citation\ Rate}{Expected\ Citation\ Rate}$$

Hutchins, B.I. et al. (2016) PLOS Biology, 14. DOI: 10.1371/journal.pbio.1002541

Relative Citation Ratio (RCR)

- Article-level Citation Metric
- Developed by the NIH Office of Portfolio Analysis (OPA).
- Implemented by the NIH as an evaluation tool
- Compares the influence of articles from different fields more fairly
- Online tool for RCR calculations:

  https://icite.od.nih.gov

Other Advanced Indicators: RCR

Advantages

- Freely accessible metric
- Transparent
- Developed and evaluated by the NIH Office of Portfolio Analysis (OPA).
- Compares the influence of articles from different fields more fairly

Disadvantages

- Algorithm is complex
- Restricted to PubMed indexed articles
- Sensitive to interdisciplinary citations and multidisciplinary journals

Other Advanced Indicators: Percentiles

- Particularly useful for normalisation
- The percentile of a published article gives an impression of the impact it has achieved when compared to similar items in the same publication year and subject category
- Not affected by skewed distributions, so that highly cited items do not receive excessively high weight
- Publications are sorted by citation numbers and are allocated to percentile ranks ranging between 0 and 100

Initiatives

COMMENT · 28 MAY 2019

Rethinking impact factors: better ways to judge a journal

We need a broader, more-transparent suite of metrics to improve science publishing, say Paul Wouters, colleagues and co-signatories.

Paul Wouters ✉, Cassidy R. Sugimoto, Vincent Larivière, Marie E. McVeigh, Bernd Pulverer, Sarah de Rijcke & Ludo Waltman

Initiatives

The Leiden Manifesto for Research Metrics

The San Francisco Declaration on Research Assessment (DORA)

Summary

- Bibliometric data has limitations
- Bibliometric data should be used in combination with qualitative assessment
- Best not to rely on one metric but a suite of metrics to tell a story